What is claimed is:

CLAIMS

1. A unit fuel injector, the injector internally preparing fuel during an injection event at a pressure sufficient for injection into an internal combustion engine by means of an intensifier piston, comprising;

a selectively actuatable controller being in fluid communication with a source of pressurized actuating fluid and being in fluid communication with a substantially ambient actuating fluid reservoir, the controller having a first valve for selectively independently porting actuating fluid to and venting actuating fluid from the intensifier piston and a second valve for selectively independently porting actuating fluid to and venting actuating fluid from a needle valve during the injection event for controlling opening and closing of the needle valve.

2. The unit fuel injector of claim 1 wherein the two valves are disposed in a coaxial arrangement.

3. The unit fuel injector of claim 2 wherein the two valves are independently electrically actuated.

4. The unit fuel injector of claim 3 wherein each of the two valves are independently solenoid operated in a first direction and spring operated in an opposed second direction.

5. The unit fuel injector of claim 1 wherein the second valve is operably fluidly coupled to a needle valve first closing surface.

6. The unit fuel injector of claim 5 wherein actuating fluid ported by the second valve to the needle valve first closing surface generates a force acting to close the needle valve.

7. The unit fuel injector of claim 6 wherein the actuating fluid ported by the second valve to the needle valve first closing surface generates a force that is greater than an opposing force acting on a needle valve opening surface, the opposing force being generated by pressurized fuel.

8. The unit fuel injector of claim 5 wherein actuating fluid is being ported by the first valve to the intensifier piston, the actuating fluid ported by the second valve to the needle valve first closing surface acting to put the intensifier piston into a state of hydraulic lock.

9. The unit fuel injector of claim 8 wherein the second valve venting the actuating fluid ported to the needle valve first closing surface acts to free the intensifier piston from the state of hydraulic lock, the needle valve then being openable by the action of fuel pressurized by the intensifier piston acting on a needle valve opening surface.

10. The unit fuel injector of claim 5 wherein the second valve is cyclable between an open and a closed disposition a plurality of times during a single cycle of the first valve to effect a plurality of fuel injections and dwell periods during a single injection event.

11. The unit fuel injector of claim 5 wherein the second valve is shiftable to port actuating fluid to the needle valve first closing surface prior to shifting of the first valve to port actuating fluid to the intensifier piston, subsequent porting of the actuating fluid by the first valve to the intensifier piston acting to effect prebuilding fuel pressure.

12. The unit fuel injector of claim 1 further including a needle back piston being operably coupled to the needle valve.

13. The unit fuel injector of claim 12 wherein the needle back piston is in fluid communication with the second valve.

14. The unit fuel injector of claim 13 wherein the needle back piston is translatably disposed in a bore, the bore defining a portion of a variable displacement chamber, a needle valve first closing surface of the needle back piston defining in part the variable displacement chamber.

15. The unit fuel injector of claim 14 wherein a return spring is disposed in the variable displacement chamber, the return spring exerting a bias on the needle valve first closing surface.

16. The unit fuel injector of claim 15 wherein the return spring bias on the needle valve first closing surface acts in cooperation with a fluid pressure on the needle valve first closing surface to generate a closing force on the needle valve.